BARRIERS TO PILL TAKING AND CLINIC ATTENDANCE FOR PEOPLE LIVING WITH HIV IN RURAL ZAMBIA

By Abbie Heffelfinger

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Reader: ____ _____

Table of Contents

Abstract

Objectives: To determine the barriers to clinic attendance and pill taking for PLHIV in rural Zambia.

Methods: This analysis uses baseline data from a 2015 cross sectional livelihood pilot study for PLHIV in rural Zambia. Univariate and bivariate analysis was conducted in Stata.

Results: Most people in this study are not experiencing barriers to clinic attendance and pill taking. The most commonly experienced barriers to clinic attendance are related to time and distance to the clinic. Bivariable results indicated significant association between education,

minutes of travel time to clinic, self efficacy and barriers to clinic attendance as well as associations between self perceived health and barriers to pill taking.

Conclusion: Interventions should be targeted toward rural, young populations with limited education. Further research is recommended on barriers to pill taking and clinic attendance, and self-efficacy.

Acronyms & Abbreviations

- AIDS: Acquired Immuno Deficiency Syndrome
- ART: Antiretroviral Therapy
- HIV: Human Immunodeficiency Virus
- LMIC: Low and Middle Income Countries
- PLHIV: People Living With HIV

Introduction

Introduction

In 2015 it was estimated that there were 36.9 million people living with Human Immunodeficiency Virus (HIV) and Acquired Immuno Deficiency Syndrome (AIDS) worldwide (UNAIDS, 2015). Of this total, 1.2 million were living in Zambia, ranking the nation 6th in sub-Saharan Africa in prevalence of HIV infections among adults age 15-49 (Sasaki et al., 2012; UNAIDS, 2015). The prevalence of HIV in Zambia has decreased from 16% of adults in 2001-2002 to 13% in 2014. However, even with this reduction the high infection rates have a profound impact on individual lives as well as overall community well-being (Central Statistics Office, Ministry of Health, and ICF, 2014).

In 1996, antiretroviral therapy (ART) was introduced as part of the strategy to reduce HIV/AIDS related deaths. As of 2015, there were 18.5 million people using ART globally (Gupta et al., 2012; Kaiser Family Foundation, 2015; UNAIDS, 2015). There has been an overall increase in access to ART by 84% in the last 10 years and an even larger increase in low- and middle-income countries (LMICs) (UNAIDS, 2015). There were 8 million people on ART in LMICs in 2011, which is a 20-fold increase of ART access since 2003 (Gupta et al., 2012; UNAIDS, 2015; UNAIDS, 2012). Although ART access is already noted as a significant global public health achievement, the World Health Organization (WHO) aims to accelerate treatment access to all PLHIV (World Health Organization, 2015).

ART access is essential to addressing the HIV epidemic but must also be coupled with ART adherence to reduce virus mutation and medication resistance. The research question for this study is what are the barriers and frequency of occurrence to clinic attendance and pill taking for PLHIV in rural Zambia. Additionally, the research examines bivariate associations between patient characteristics and their reported barriers to clinic attendance and pill taking. If we are able to determine the barriers to ART adherence then we can design HIV treatment interventions that are well suited to helping patients and medial systems achieve optimum adherence. This research contributes to the emerging literature on barriers to ART adherence among PLHIV in rural Zambia.

Antiretroviral Therapy & Adherence

HIV makes it difficult for the body to fight diseases (Government of the Republic of Zambia, 2010). The virus replicates quickly and overwhelms the immune system so that eventually the body is no longer able to fight off opportunistic infections (Government of the Republic of Zambia, 2010). When it reaches that point, it is classified as the advanced stage of HIV infection or Acquired Immune Deficiency Syndrome (AIDS) (Government of the Republic

of Zambia, 2010). HIV is spread through bodily fluids and can be prevented through use of condoms, sterile needles and tested blood transfusions (Government of the Republic of Zambia, 2010).

Antiretroviral therapy (ART) is a combination of antiretroviral medications that control the HIV virus (Government of the Republic of Zambia, 2010). ART was introduced in the Zambian private sector in 2002 and expanded to the public sector in 2005 (Moomba, 2012). ART is administered to people living with HIV to slow progression of HIV to AIDS, reduce mortality, improve well-being and prevent new infections (Akilleswaran et al., 2005; Amberbir et al., 2008; Farmer et al., 2001; Lawn et al., 2008). ART must be taken correctly 95% of the time to prevent virus replication and mutation that ultimately leads to medication resistance (Bangsberg et al., 2001; Government of the Republic of Zambia, 2010; Kaiser Family Foundation, 2015; Muya et al., 2014; Yaya et al., 2014). Medication resistance means that the ART medicine combination is no longer effective on suppressing HIV and a new combination must be administered (Government of the Republic of Zambia, 2010). ART medicine combination options are limited and they increase in price as well as side effects as patients move from first line regimens to newer ones (Government of the Republic of Zambia, 2010). This is a challenge for an individual but it can also impact a community because the new ART resistant strain of HIV can be transmitted from person to person, meaning that those with new infections may struggle to find effective and affordable ART (Government of the Republic of Zambia, 2010; Gupta et al., 2012).

Pill taking is defined as the ingestion of ART medication as per medical provider recommendations (for example, accurate dose, timetable, and nutrition) where as clinic attendance is defined as going to a medical facility for medical check ups and prescription refills. Together these elements make up ART adherence (Bangsberg et al, 2001; DiMatteo, 2004).

Often research only considers pill taking rather than the broader multi-dimensional elements of adherence. Therefore, in this study, adherence is broken down into the actions of clinic attendance and pill taking to try and understand multiple influences impacting adherence for PLHIV in rural Zambia.

A patient is considered to be adherent to their ART medication if they follow provider recommendations (schedule, nutrition, etc.) for their medication regimen ≥95% of the time (Amberbir et al., 2008). Rates of ART adherence vary worldwide and are reported to be between 50-94% in sub-Saharan Africa (Amberbir et al., 2008; Chesney, 2000; DiMatteo, 2004; Gill et al., 2005; Oku et al., 2013; Orrel et al, 2003; Yaya et al., 2014). These rates are reportedly on par or better than those in resource-adequate countries (DiMatteo, 2004; Hardon et al., 2007; Orrel et al., 2003). A study in rural Zambia showed that 60% of patients achieved full adherence at 6 weeks by never skipping doses and following the time requirements of their recommended ART regimen (Sasaki et al., 2012).

Barriers to Pill Taking and Clinic Attendance

Adherence is a dynamic process so it is important to identify and address factors that influence PLHIV's ability to adhere to ART, which in turn, improves their health and reduces ART resistance (Amberbir et al., 2008). Prior research indicates that adherence is influenced by numerous factors including age, gender, education, socioeconomic status, and psychosocial factors (Amberbir et al., 2008; DiMatteo, 2004). Many barriers to adherence are applicable to both clinic attendance and pill taking such as stigma, poor health information, low education levels, and transportation costs (Hardon et al, 2007; Moomba, 2012; Muya et al., 2014). For example, if a PLHIV is unable to afford transportation to visit the clinic they may not be able to get a prescription for the appropriate ART and/or collect pills from the pharmacy. Although factors associated with adherence are consistent across multiple studies, it is important to note

that there are some studies that have shown conflicting information regarding the relationship between socio-demographics and ART adherence (Amberbir et al., 2008). For example, gender and age do not have a consistent strength or direction of association with adherence (DiMatteo, 2004).

The barriers unique to clinic attendance are usually related to cost and time. For example, travel time to the clinic and wait times at the clinic are often a barriers to clinic attendance (Hardon et al, 2007; Moomba, 2012; Muya et al., 2014). Additionally, while antiretroviral drugs are often free, other costs (for example, transport and missed income opportunities) prevent PLHIV from adhering to ART (Hardon et al, 2007). Barriers unique to pill taking include complexity of regimen, food insecurity, stigma, forgetfulness, feeling ill, being busy, lack of appropriate counseling, medication side effects, running out of medication and medication/food demands (Amberbir et al., 2008; Hardon et al., 2007; Moomba, 2012; Muya et al., 2014).

Research Methods

Data and Sample

The study was cross sectional and examined ART adherence, access to food, dietary intake, income and expenditures, and psychosocial outcomes (e.g., self-efficacy and hope for the future). The study used baseline data from a pilot livelihood study for PLHIV in rural Zambia, which was collected in 2015 by interviewer-administered survey. Participants for the study were randomly selected from ART enrollment patient lists at two health centers within Lundazi District, Eastern Province, Zambia. Each health center recruited approximately 50 patients to participate in the study for a total of 101 participants. Inclusion criteria specified that subjects be at least 18 but no older than 40 years of age, economically poor, male or female, HIV positive, and currently receiving outpatient medical care and ART at either Lundazi District Hospital or

Lumezi Mission Hospital. Economically poor is defined as individuals who are living below the Zambian national poverty threshold (475,000 Zambian kwachas or $131 USD annually). The economic and age criteria were set to capture persons more likely to participate in a microenterprise as part of the study. Persons under 18 are likely to be economically dependent on their parents and/or attending school and persons older than 40 are less economically active in Zambia.

Data were collected using a survey to capture demographic information such as age, sex, marital status, ethnic group, religious group, school, occupation, monthly income, water source, fuel source, dwelling materials, general health and distance from home to the health facility in minutes/kilometers. Outcome variables such as barriers to clinic attendance and pill taking were collected through a series of questions on the same survey. The study was approved by IRBs at the University of North Carolina at Chapel Hill and the University of Zambia. Written consent was obtained from all study participants.

Measures

Outcome Variables. The barriers to pill taking and clinic attendance for PLHIV were measured using the "Structural Barriers to Clinical Attendance" (SBCA) and "Structural Barriers to Medication Taking" (SBMT) instruments (Coetzee & Kagee, 2013). Coetzee and Kagee developed these as new scaled instruments for barriers to clinic attendance and medication taking in sub- Saharan Africa. SBCA and SBMT ask ART patients to identify the extent to which structural barriers to clinic attendance and pill taking apply to their own circumstances. For example, "I do not attend my clinic appointments because the clinic is too far from the bus stop/taxi rank" or "I have difficulty taking my ART pills because I do not always have food with which to take them." "A Likert-type scale ranging from 1 to 5 was provided where 1 indicated

"Never", 2 indicated "Rarely", 3 indicated "some of the time", 4 indicated "most of the time", and 5 indicated "always" (Coetzee & Kagee, 2013). Each outcome includes a set of 12 questions.

Explanatory Variables. Self-efficacy was measured through a series of likert scale questions about confidence in ART treatment adherence for the past month. For example, "In the past month, how confident have you been that you can stick to your treatment plan even when side effects begin to interfere with daily activities?" or "In the past month, how confident have you been that you can integrate your treatment into your daily routine?" The likert scale responses were on a scale from 0-9 with 0 being, "Cannot do it at all" and 9 being, " Certain can do it" (Johnson et al., 2007). Perceived stress was measured through a series of likert scale questions about feelings and thoughts during the last month. For example, "In the last month, how often have you been upset because of something that happened unexpectedly?" or "In the last month, how often have you felt that you were unable to control the important things in your life?" The likert scale responses were on a scale from 0-4 with 0 being, "Never" and 4 being, "Always."

Analysis Plan

Univariate analysis assessed the distribution of respondents and their background demographic characteristics. Additionally, univariate analysis included prevalence of various barriers to ART adherence. Bivariate analysis assessed the association between different barriers to adherence and demographic characteristics, perceived stress and self-efficacy. Bivariate tests included two tailed t test, simple linear regression, and chi square with alpha set at 0.05.

Responses to multi-answer questions such as perceived stress, self-efficacy and barriers to ART adherence were added together to create a scaled response. For example, a value was determined for each likert scale response to each question about perceived stress and these values were added together to create a total perceived stress score. If a respondent answering perceived

stress questions answered one for question one, three for question two and one for question three, the total score for perceived stress would be five. This total score was used as the dependent variable in bivariate analysis.

The statistical tests used to examine the research question were run in Stata.

Results

Descriptive

As seen in Table 1, the sample consisted of 101 participants. Fifty percent of the sample is female, 50% of the sample is male. The mean age is 37.5 years (SD = 7.4)**.** 75% of participants are married. 68% of participants are members of the Tumbuka ethnic group and 83% identify as Christian. Thirty-five percent of participants achieved education beyond primary school and 75% are farmers. Participants live an average of 11.4 kilometers (SD = 12.3) or 110.2 minutes (SD = 97.7) from home to the health facility but the standard deviation indicates that the distance is quite varied across participants. As was intended by the inclusion criteria, participants live in rural areas and have limited education and economic involvement.

Table 1: Distribution of sample respondent background characteristics (N=101 unless otherwise noted)	
	# (%)
Location	
Lundazi	51 (50)
Lumezi	50 (50)
Age (Mean 37.5, SD 7.4)	
<35	32 (32)
≥35	69 (58)
Gender	
Female	57 (56)
Male	44 (44)

Table 1: Distribution of sample respondent background characteristics (N=101 unless otherwise noted)	
	# (%)
Marital Status	
Currently Married	76 (75)
Not Currently Married (Includes: divorced, separated, widowed or single)	25 (25)
Ethnic Group	
Tumbuka	69 (68)
Not Tumbuka (Includes: Nsenga, Tonga, Chewa and other tribes)	32 (32)
Religious Group	
Christian	84 (83)
Not Christian (Includes: Muslim, Traditional/Spiritualist, Non-religious and other)	17 (17)
Highest level of school	
Primary or less than primary	66 (65)
More than primary	35 (35)
Occupation	
Farming	76 (75)
Not Farming (Includes: Trading, construction, managerial/professional, service, no occupation and other)	25 (25)
Head of household	
Yes	66 (65)
No	35 (35)
Average household income per month?	
K0-K20	46 (46)
>K20	55 (54)
Main source of drinking water for the household	
Organized (Includes: In dwelling, on site, public tap, borehole and well)	85 (84)
Natural (Includes: Dam/pond/stagnant and flowing/stream)	16 (16)
Main source of energy for cooking (N=99)	
Wood	87 (86)
Not Wood (Includes: Electric and charcoal)	14 (14)
Main materials used for the roof of your dwelling place	
Thatch	75 (74)
Not Thatch	26 (26)

Table 1: Distribution of sample respondent background characteristics (N=101 unless otherwise noted)	
	# (%)
(Includes: Asbestos, plastic, corrugated iron and cement block)	
Description of your health in general	
Poor/Fair/Good	56 (55)
Very good/Excellent	45 (45)
From your home, approximate distance to the health facility in kilometers (Mean 11.4; SD 12.3)	
≤11	65 (64)
>11	36 (36)
From your home, approximate number of minutes it takes to travel to the health facility (Mean 110.2; SD 97.7)	
≤110	62 (61)
> 110	39 (39)

Barriers to Pill Taking and Clinic Attendance

In both the barriers to clinic attendance and pill taking participant responses span the full available range of the scale. However, responses are highly skewed toward never experiencing barriers. When compiled into scale response, as described in "Analysis Plan", the total results of both barriers to clinic attendance (Mean: 5.3, SD: 9.7, Range: 0-44) and pill taking (Mean: 3, SD: 7.7, Range: 0-44) show that the standard deviation is higher than the mean. This shows that there is a large variation as to whether or not there are perceived barriers to clinic attendance. The means barriers to both clinic attendance and pill taking are very low which demonstrates that most people do not perceive barriers to clinic attendance or pill taking as measured by these scales.

As seen in Table 2, at least 74% of people reported never experiencing any of the barriers to clinic attendance. The most commonly experienced barriers to clinic attendance are related to access to the clinic—distance, travel expenses, and travel times. Between 13% and 18% of the sample reported always experiencing these barriers. Other findings that stood out in the barriers

to clinic attendance were that 8% of participants reported that some of the time staff are rude to them, 9% of the participants reported that some of the time they have to wait too long to see a doctor/nurse/pharmacist, and 8% reported that some of the time the clinic is too crowded.

As seen in Table 3, at least 77% of people reported never experiencing each of the barriers to pill taking. 9% says they always avoid taking pills if they have to take in front of others. Generally, participants reported very few barriers to pill taking.

Table 2: Proportion of Sample Experiencing Barriers to Clinic Attendance at Baseline (N=101)

I do not attend my clinic appointments because:	**Never**	**Rarely**	**Some of the time**	**Most of the time**	**Always**
1. The clinic is too far from the bus stop/taxi rank (N=100)	75%	7%	2%	3%	13%
2. Transport to the clinic is too expensive	74%	6%	0%	2%	18%
3. It takes too much time to travel to and from the clinic.	75%	7%	1%	1%	16%
4. I do not want to be identified as HIV positive.	82%	6%	5%	2%	5%
5. The staff at the clinic is rude to me.	86%	5%	8%	0%	1%
6. The staff at the clinic is impatient towards me	86%	8%	5%	0%	1%
7. There is no privacy at the clinic when I meet with the nurse.	87%	7%	0%	0%	6%
8. I cannot get time off work to do so.	85%	6%	2%	1%	6%
9. I have to wait too long to see the doctor, nurse or pharmacist.	82%	5%	9%	2%	2%
10. I feel unsafe walking to and from the clinic.	81%	6%	6%	3%	4%
11. The clinic is too crowded.	80%	6%	8%	1%	5%
12. There is no place where I can speak to a nurse or counselor without being heard by other people.	91%	6%	1%	0%	2%
Distribution - Mean: 5.3; SD: 9.7; Min: 0; Max: 44					

Table 3: Proportion of Sample Experiencing Barriers to Pill Taking at Baseline (N=101)

	Never	Rarely	Some of the time	Most of the time	Always
1. I have difficulty taking my ART pills. Because I do not always have food with which to take them.	84%	7%	4%	2%	3%
2. Taking my ART pills when I do not have food to eat makes me feel ill.	77%	9%	4%	4%	6%

Table 3: Proportion of Sample Experiencing Barriers to Pill Taking at Baseline (N=101)					
	Never	Rarely	Some of the time	Most of the time	Always
3. I do not take my pills if I have to take it in front of others.	79%	8%	2%	2%	9%
4. I do not take my pills because I do not have a way to remind me to take them.	89%	6%	2%	0%	3%
5. I forget to take my ART pills.	88%	7%	1%	1 %	3%
6. I do not take my ART pills because the church pastor has told me not to.	92%	5%	0%	0%	3%
7. When I drink alcohol I forget to take my ART pills.	91%	6%	0%	0%	3%
8. I do not take my ART pills because I do not have someone to remind me to do so.	89%	7%	1%	0%	3%
9. I do not take my ART pills because traditional healing works better for me.	92%	5%	0%	0%	3%
10. I do not take my ART pills because I cannot afford the food I need to eat when I take them.	90%	7%	0%	1%	2%
11. I do not take my pills because I do not like taking them in front of my family.	89%	6%	1%	0%	4%
Distribution – Mean: 3; SD: 7.7; Min: 0; Max 44					

Bivariable Results

Bivariate analysis was conducted using t-test, simple linear regression and chi-square to analyze the association between each background variable and the barriers to ART response scales.

As seen in Table 4, there is a statistically significant association between barriers to clinic attendance and age ($p = 0.0564$). Older PLHIV experience fewer barriers to clinic attendance while younger PLHIV experience more barriers to clinic attendance. This finding is consistent with prior studies that age is inversely associated with adherence (DiMatteo, 2004).

There was a statistically significant association between barriers to clinic attendance and education ($p = 0.0154$) (Table 4). Those with higher education reported fewer barriers, those with less education reported more barriers. This finding is consistent with prior studies that show an inverse association between adherence and education (Moomba, 2012; Yaya et al., 2014).

There was a statistically significant association between barriers to clinic attendance and minutes of travel time to the health clinic (Robust p = 0.003) (Table 4). Similar findings of a statistically significant association between travel time and barriers to adherence are found in other studies (Hardon et al., 2007; Moomba, 2012; Muya et al., 2014). While it is logical that distance from the clinic could be a barrier to clinic attendance, the findings did not show a statistically significant association between barriers to clinic attendance and distance from the health clinic in kilometers. Because of these findings, additional tests were run which dichotomized the distance from the health clinic and minutes to the health clinic, based on the mean, to determine if there was a statistically significant association. The robust dichotomized distance in kilometers to the health facility was found to be statistically significant (p = 0.031) indicating that those who travel fewer than 11 kilometers to the health clinic face fewer barriers to clinic attendance than those who travel more than 11 kilometers to the clinic.

Existential dimensions (meaning, self-determination and quality of life) play a key role in adherence and are often overlooked in research (Wright, 2000). Studies vary in their results of self-efficacy as a predictor of ART adherence (Wright, 2000). As seen in Table 4, the findings in this study show a statistically significant association between ART treatment self-efficacy and barriers to clinic attendance (p = 0.0009). This means that those with higher levels of self-efficacy reported fewer barriers to clinic attendance. Self-efficacy was not significantly associated with barriers to pill taking.

Self-perceived health was significantly associated with barriers to pill taking (p = 0.055). ART patients with better self-perceived health reported fewer barriers to pill taking compared to ART patients with poor self-perceived health.

Table 4: Bivariable analysis of patient characteristics and barriers to clinic attendance & pill taking		
	Barriers to Clinic Attendance	**Barriers to Pill Taking**
Age (<35/≥35)	*p = 0.0564	P = 0.5734
Gender (Male/Female)	p = 0.5648	p = 0.8478
Marital Status (Currently Married/Not Currently Married)	p = 0.3758	p = 0.6595
Ethnic Group (Tumbuka/Not Tumbuka)	p = 0.2882	p = 0.4764
Religious Group (Christian/Not Christian)	p = 0.1198	p = 0.5774
Highest level of school (Primary or less than primary/More than primary)	*p = 0.0154	p = 0.3333
Occupation (Farming/Not Farming)	p = 0.1059	p = 0.6813
Head of household (Yes/No)	p = 0.4215	p = 0.5944
Average monthly household income (K0-K20/>K20)	p = 0.0899	p = 0.6514
Main source of drinking water for the household (Organized/Natural)	p = 0.1153	p = 0.4403
Main source of energy for cooking (Wood/Not wood)	p = 0.0845	p = 0.1163
Main materials used for the roof of your dwelling place (Thatch/Not Thatch)	p = 0.6718	p = 0.1956
Description of your health in general (Poor/Fair/Good vs. Very good/Excellent)	p = 0.1711	*p = 0.055
Distance from your home to the health facility in kilometers		
With outliers (70km x 2)	p = 0.669	p = 0.112
Robust	p = 0.504	p = 0.179
Dichotomized ≤ 11/ >11	p = 0.17	p = 0.228
Robust	*p = 0.031	p = 0.143
Distance from your home to the health facility in minutes		
Regular	*p= 0.009	p = 0.908
Regular Robust	*p=0.003	p = 0.946

Table 4: Bivariable analysis of patient characteristics and barriers to clinic attendance & pill taking		
	Barriers to Clinic Attendance	**Barriers to Pill Taking**
Dichotomized ≤110/>110	*p = 0.021	p = 0.684
Dichotomized Robust	*p = 0.027	p = 0.701
ART Treatment Adherence Self-Efficacy	*p = 0.0009	p = 0.385
Perceived Stress	p = 0.086	p = 0.081

Discussion

Discussion

The results of this study are important because they indicate that most people are not experiencing barriers to clinic attendance and pill taking as measured by these scales (Tables 2 & 3). This does not mean that adherence is not a challenge for some patients but instead suggests that interventions should be thoughtfully targeted to those people who require additional support in overcoming barriers to clinic attendance and pill taking.

Some of the specific barriers are discussed below:

ART interventions should be designed to reach rural population. As seen in Table 2, distance and travel time are the most perceived barriers to clinic attendance, which is particularly significant for rural populations.

The fact that 9% of people always avoid taking pills in front of others means that although there are few barriers to pill taking, there are still challenges with stigma. Reduction of stigma is a social change that takes time but could have a profound impact on communities in terms of increasing adherence to also decrease ART resistance.

Although research has mixed findings on the association between age and adherence, this study shows that there is a statistically significant association between age and barriers to clinic attendance. Due to their youth, young people are more likely to spend a long time on ART so

their adherence is of particular concern to ensure that they do not run out of ART options if they encounter resistance. More research is needed to focus on determining the most effective intervention for young people.

Existential dimensions (meaning, self-determination and quality of life) were not the focal point of the study and yet they produced some of the strongest results. The findings demonstrate a statistically significant association between ART treatment self-efficacy and barriers to clinic attendance ($p = 0.0009$). It is unclear whether those who feel confident to adhere to ART report fewer barriers or if fewer barriers lead to a confidence to take ART. Future research is needed to clarify results and determine whether targeted self-efficacy interventions could have an impact on increasing ART adherence.

A topic not explored in this study that could be investigated in further research is the relationship between barriers to adherence and ART attrition as some research shows that barriers lead to attrition (Musheke et al., 2012). Estimates suggest that only 60% of patients continue ART after 2 years for reasons similar to the barriers to clinic attendance and pill taking examined here (Musheke et al., 2012). Traditional complementary and alternative medicines as well as religious beliefs are among factors that have been shown to predict attrition and should be part of further research (Moomba, 2012; Musheke et al., 2012).

Implications

ART adherence should be improved to increase positive heath outcomes for persons living with HIV as well as to reduce ART resistance and transmission of HIV. However, achieving 100% ART adherence is not realistic (Wright, 2000). Therefore, it's also important to invest in early HIV diagnosis, ART access and delivery, as well as long term care (Lawn et al., 2008).

The results of this study can provide useful insights into targeted interventions. Because the barriers to clinic attendance are greater than those of pill taking, it is best to invest energies in reducing barriers to clinic attendance. Multi dimensional interventions that target individual needs are recommended (Wright, 2000). A strategy such as increased refill times (3 months instead of 1) are recommended to decrease the number of times patients need to overcome barriers to clinic attendance (Hardon et al., 2007). Alternatively, some ART delivery models utilize a home-based care system to reach resource-limited rural environments (Weidle, et al. 2006). Increased accessed to education or interventions that target self-efficacy could also have an impact on reported barriers to clinic attendance.

Limitations

The sample size for this study is small which may limit power and ability to detect effects. A larger sample size may have provided more statistically significant findings. However, the fact that there were many non-statistically significant findings is not dissimilar from the literature which, says that there is not one combination of predictors or barriers to pill taking and clinic attendance (Wright, 2000).

Another limitation for this research is the possibility for response bias from the respondents. Individuals may have misremembered their ART regimen practices or responded with answers designed to please the interviewer. Additionally, questions such as those about distance assume accuracy of time keeping or distance awareness and may have created unintentional response bias. Though the study design intended to minimize this bias, it cannot be avoided completely.

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